

THE GENUS *CARPOMYA* COSTA (DIPTERA: TEPHRITIDAE):
NEW SYNONYMY, DESCRIPTION OF FIRST AMERICAN SPECIES,
AND PHYLOGENETIC ANALYSIS

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Abstract.—*Carpomya tica*, new species, from Costa Rica is described and reported as the first species of *Carpomya* from the Americas. Phylogenetic relationships within *Carpomya* are analyzed. *Myiopardalis* Bezzi and *Goniglossum* Rondani are recognized as subjective junior synonyms of *Carpomya*. *Carpomya wiedemanni*, n. comb., and *C. pardalina* (originally described in *Carpomya*) are transferred to *Carpomya* from *Goniglossum* and *Myiopardalis*, respectively, and *Spilographa caucasica* Bigot is removed from the genus. A lectotype is designated for *C. pardalina*, and a key to the species of *Carpomya* is provided.

Resumen.—Se describe *Carpomya tica*, especie nueva, de Costa Rica, la primera especie de *Carpomya* de las Américas. Se analizan las relaciones filogenéticas dentro de *Carpomya*. *Myiopardalis* Bezzi y *Goniglossum* Rondani son sinónimos subjetivos nuevos de *Carpomya*. Se transfieren *C. pardalina* (descrita originalmente en *Carpomya*) y *Carpomya wiedemanni*, n. comb., a *Carpomya* de *Myiopardalis* y *Goniglossum*, respectivamente, y se remueve *Spilographa caucasica* Bigot de este género. Se designa un lectotipo para *C. pardalina*, y se provee una clave a las especies de *Carpomya*.

Key Words: Fruit flies, Tephritidae, *Carpomya*, *Myiopardalis*, *Goniglossum*

The genus *Carpomya* Costa (1854) previously included four species known from the southern Palearctic, northeastern Afro-tropical, and western Oriental Regions, although one of these species, *C. caucasica* (Bigot) does not seem to belong in this genus. The monotypic genera *Myiopardalis* Bezzi (1910) and *Goniglossum* Rondani (1856), here considered new subjective junior synonyms of *Carpomya*, included one southern Palearctic/western Oriental species and one Palearctic species, respectively. This paper reports the discovery of the first American species of *Carpomya*, increasing the number of species of this genus to six, and substantially extending its distribution.

METHODS

I follow the morphological terminology of McAlpine (1981), except as noted by Norrbom and Kim (1988). Terminology for the wing pattern follows Foote (1981, see Fig. 71). Taxonomically useful characters within *Carpomya* are listed in Table 1 and the distributions of their states are shown in Table 2, but only the nine characters with an asterisk were used in the phylogenetic analysis; the others are autapomorphies. The Hennig86 program was used for phylogenetic analysis, with the *Rhagoletis tabellaria* group as the outgroup for assigning character polarities. Transformation series and the polarity of some characters are fur-

Table 1. Characters taxonomically useful for species of *Carpomya*. Only characters with an * were used in phylogenetic analysis.

1. Head elongate, gena especially produced and angulate anteriorly, and proboscis long geniculate—0) no; 1) yes.
2. Facial carina—0) moderately to strongly produced dorsally, gradually becoming broader and less produced ventrally; 1) weakly produced, gradually becoming broader ventrally; 2) strongly produced dorsally, rather abruptly becoming very broad and weakly produced near midlength; 3) extremely produced and moderately broad throughout, carinate on both sides. States 1, 2, and 3 are here considered independently derived autapomorphies.
- *3. Ocellar setae—0) well developed; 1) minute, length less than width of ocellar tubercle.
4. First flagellomere—0) with dorsoapical point; 1) rounded dorsoapically.
- *5. Mesonotal color and microtrichia pattern—0) unicolorous except white areas, or if partially brown without microtrichia or with microtrichia unicolorous; 1) with pattern of dark brown or black marks (similar to Fig. 1), some without microtrichia, others with dense black microtrichia.
- *6. Scutellar color pattern—0) brown basally, white apically; 1) with medial brown spot extended to apex or with smaller isolated medial brown spot and apical brown spot(s); 2) without medial brown spot, pale area m-shaped, with medial pale arm; 3) entirely yellow. The transformation series of this character is uncertain and it was coded unordered in the Hennig86 analysis. *Carpomya tica*, *pardalina* and *wiedemanni* were all coded 1, although there are some differences in their scutellar patterns: *C. tica* has a large medial brown spot and U-shaped yellow area which includes the apical setae (Fig. 1); *C. pardalina* has a smaller medial brown spot, isolated by a larger pale area from an apical brown spot or spots on which the apical setae are located; and *C. wiedemanni* is variable, either like *C. pardalina*, or with the medial brown spot large and including the apical setae (Freidberg & Kugler 1989: 191).
- *7. Scutellum shape—0) relatively triangular in dorsal view, disc flat to slightly convex; 1) almost semicircular in dorsal view, disc slightly to moderately convex (a little less convex in *incompleta* than in *schineri* and *vesuviana*); 2) almost semicircular in dorsal view, disc very strongly convex.
- *8. Katepisternum—0) unicolorous brown (*R. tabellaria* group) or yellow (*C. tica*); 1) yellow or orange, with dorsal margin white (contrast often weak in *C. incompleta* and *pardalina*); 2) with large brown or black area, dorsal margin white. State 0 appears to be plesiomorphic, although it should be noted that states 1 and 2 occur in *Zonosemata*.
- *9. Cell r_1 with spur vein—0) with at most a dark spot or crease within the subapical band; 1) with a distinct spur vein originating from vein R_{2+3} in the subapical band.
10. Crossvein r-m—0) near midpoint between bm-cu and dm-cu, within or at apical margin of discal band; 1) at 0.73 distance from bm-cu to dm-cu, touching proximal margin of subapical band.
11. Subbasal and discal bands—0) not connected or connected posteriorly; 1) connected in cells r_1 and br.
12. Anterior apical wing band—0) present; 1) absent.
- *13. Epandrium—0) mostly brown; 1) mostly yellow with small dorsomedial brown spot. In other mostly yellow *Carpomyini* the epandrium is mostly brown or all yellow or has paired dorsolateral spots, although in *Zonosemata* it varies from states 0 to 1, sometimes intraspecifically.
14. Aculeus tip—0) nonserrate; 1) serrate.
- *15. Spermatheca number—0) 3; 1) 2. The number of spermathecae varies from 2–3 in the *R. tabellaria* group and other *Rhagoletis* and *Carpomyini* (Bush 1966, Norrbom 1994b), but 3 is the plesiomorphic state for Tephritidae, so I tentatively coded that number as plesiomorphic within *Carpomya* and assigned that state to the outgroup in the Hennig86 analysis.
16. Spermatheca shape—0) single chambered; 1) double chambered.
- *17. Host plant—0) *Rosa* spp. (Rosaceae); 1) *Ziziphus* spp. (Rhamnaceae); 2) Cucurbitaceae (*C. pardalina* breeds in *Cucumis*, *Citrullus*, and *Ecballium* spp., and *C. wiedemanni* in *Bryonia* spp.). The transformation series is uncertain; states 1 and 2 are probably apomorphic, as *C. pardalina* and *C. wiedemanni* are the only two species of *Carpomyini* known to breed in Cucurbitaceae, and *C. incompleta* and *C. vesuviana* are the only *Carpomyini* known from Rhamnaceae (Freidberg & Kugler 1989, White & Elson-Harris 1992), but these states may be independently derived from state 0 or some other state (a wide range of host families are attacked by *Carpomyini*). The hosts of *C. tica* are unknown. Coded unordered in the Hennig86 analysis.

Table 2. Character state distributions among species of *Carpomya*.

Taxa	Characters																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
outgroup	0	0/1	0	0	0	0	0	0	0	0	0	0	0	0	0/1	0	?
<i>tica</i>	0	1	0	0	1	1	2	0	0	1	0	0	0	?	?	?	?
<i>pardalina</i>	0	2	0	0	1	1	0	1	1	0	0	0	1	0	0	1	2
<i>wiedemanni</i>	1	3	0	1	1	1	0	2	1	0	1	0	1	1	0	0	2
<i>schineri</i>	0	0	0	0	1	2	1	2	0	0	0	0	1	0	1	0	0
<i>incompleta</i>	0	0	1	0	0	3	1	1	0	0	0	1	1	0	1	0	1
<i>vesuviana</i>	0	0	1	0	1	2	1	1	0	0	0	0	1	0	1	0	1

ther discussed in Table 1. Note that characters 6 and 17 were treated as unordered.

TAXONOMY

KEY TO THE SPECIES OF *CARPOMYA*

1. Vein R₂₊₃ with a distinct, anteriorly directed spur vein in the subapical band. Three spermathecae. Host plants Cucurbitaceae. 2
- Vein R₂₊₃ without a spur vein, cell r₁ with at most a dark spot or crease within the subapical band. Two spermathecae (unknown for *C. tica*). Host plants not Cucurbitaceae (unknown for *C. tica*). 3
2. Head elongate, gena especially produced and angulate anteriorly. Proboscis long geniculate. Facial carina strongly produced throughout and only slightly wider ventrally than dorsally. Katepisternum with a large dark brown spot medially. Subbasal and discal bands connected in cells r₁ and br. Aculeus tip serrate. Europe, Israel. *wiedemanni* (Meigen)
- Head not elongate, gena rounded anteriorly. Proboscis short, capitate. Facial carina strongly produced dorsally, but ventral half very broad and weakly produced. Katepisternum yellow or orange, except for whitish dorsal margin. Subbasal and discal bands not connected. Aculeus tip nonserrate. Caucasus, Turkey, Cyprus and Egypt to western India. *pardalina* Bigot
3. Crossvein r-m near midpoint between bm-cu and dm-cu, within or at apical margin of discal band. Scutellum dark brown with m-shaped whitish area, including a medial pale mark, or entirely yellow. Old World. 4
- Crossvein r-m at about 3/4 distance from bm-cu to dm-cu, touching proximal margin of subapical band (Fig. 2). Scutellum dark brown with U-shaped yellowish mark (Fig. 1), without medial pale mark. Host plants unknown. Costa Rica. *tica*, n. sp.
4. Scutum and scutellum with large dark brown or black spots or markings. Anterior apical

- band of wing present. Ocellar seta well developed or minute. 5
- Scutum and scutellum without brown or black spots or markings. Anterior apical band of wing absent. Ocellar seta minute, length less than width of ocellar tubercle. Host plants *Ziziphus* spp. Southern Europe, Middle East, Egypt, Sudan, Ethiopia. . . . *incompleta* (Becker)
5. Ocellar seta well developed. Katepisternum with at least a large dark brown spot medially, usually mostly dark brown except whitish dorsal margin. Host plants *Rosa* spp. Central Europe to Kazakstan and Israel. . . . *schineri* (Loew)
- Ocellar seta minute, length less than width of ocellar tubercle. Katepisternum yellow or orange, except for whitish dorsal margin. Host plants *Ziziphus* spp. Italy, Bosnia, Caucasus, Central Asia, Pakistan, India, Thailand. *vesuviana* Costa

Carpomya pardalina Bigot

Carpomya pardalina Bigot 1891: 51.
Myiopardalis pardalina: Bezzi 1910: 11; Freidberg and Kugler 1989: 194; White and Elson-Harris 1992: 349. See latter two publications for additional references.
Carpomya (Myiopardalis) pardalina: Zaitzev 1919: 66; Rohdendorf 1939: 8; Kandybina 1965: 668 [larva].
Carpomya (Myiopardalis) caucasica Zaitzev 1919: 64; Stackelberg 1928: 281 [synonymy]; Zaitzev 1947: 6 [synonymy].

Bigot described *C. pardalina* from "plusieurs" (several) specimens of both sexes from "Belouchistan" (Baluchistan, an area extending from southeastern Iran to western

Pakistan). In the Bigot Collection, now at the University Museum, Oxford, there are three specimens (2 ♂ 1 ♀) on separate pins, one of each sex also with a larva pinned below the adult specimen. The pin of the female, here designated as lectotype, has a thin paper label of the style that Ackland and Taylor (1972, Fig. 6) found mainly on specimens with Bigot manuscript names. The lectotype's label has the following data in Bigot's writing: "*Carpomyia pardalina* [the second half of the specific name written over some other letters] ♀ \ n. sp. Inedit. \ qui[rest of word illegible] Octobre 1890. J. Bigot \ Belouchistan \ attaque les melons." There is a fourth pin with a similar label except for a "♂" symbol instead of "♀." It has only some debris, perhaps the remains of a third syntype male. The lectotype is pinned through its abdomen and has slightly shriveled eyes, but otherwise is in good condition. All of these specimens fit Bigot's description and the traditional interpretation of this species.

Carpomyia caucasica Zaitzev (1919) was described from male and female specimens from "East Transcausia, Dzhevan-shir, Areshsk territory, Elisavetn region and North Mugan." Elisavetn is probably the locality in Azerbaijan that has also been known as Gandzhe, Kirovabad, and Yelisevetspol (A. Konstantinov, personal communication). This name has long been considered a synonym of *C. pardalina* by Russian workers (Stackelberg 1928, Zaitzev 1947, Kandybina 1965), but has been little noticed by western authors. It was omitted from the Palearctic Diptera catalog (Foote 1984). I examined a pair of specimens of *C. pardalina* in the Zoological Institute, St. Petersburg with the following label data: "A3. o. 3. CT." [= Azerbaijan?] and handwritten localities that I cannot decipher; the male with the date "19/viii 1928", and the female with the date "3/viii 1927." The female also has a determination label with "*Myiopardalis caucasica* m., Zaitzev det." These specimens cannot be types because their collection dates are subsequent to the

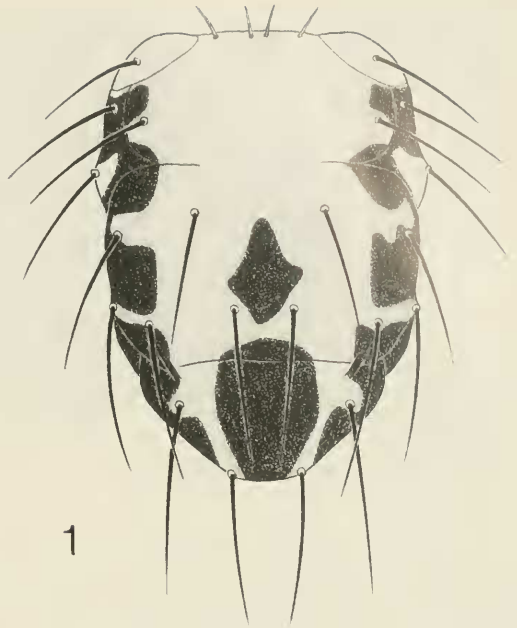


Fig. 1. *Carpomyia tica*, thorax, dorsal view.

date of description, but their identity helps to confirm the synonymy of this name.

As explained in the Relationships section, I follow Zaitzev (1919, 1947), Rohdendorf (1939) and Kandybina (1965) in including *pardalina* in *Carpomyia*, rather than in the monotypic genus *Myiopardalis*, as it has been treated by the majority of authors.

***Carpomyia tica* Norrbom, new species**
(Figs. 1–4)

Holotype.—♂ (at USNM, for eventual deposit in Instituto Nacional de Biodiversidad, Heredia, Costa Rica), COSTA RICA: San José: Zurquí de Moravia, 10°03'N 84°01'W, 1600 m, Malaise trap, V.1992, P. Hanson.

Diagnosis.—*Carpomyia tica* differs from all other species of *Carpomyia* and most other *Carpomyina* in the distal location of crossvein r-m (Fig. 2), which is at the apical $\frac{3}{4}$ of cell dm versus near the middle of that cell in other *Carpomyina* except *Cryptodacus* spp. and *Haywardina cuculi* (Hendel), which differ from *Carpomyia* in having



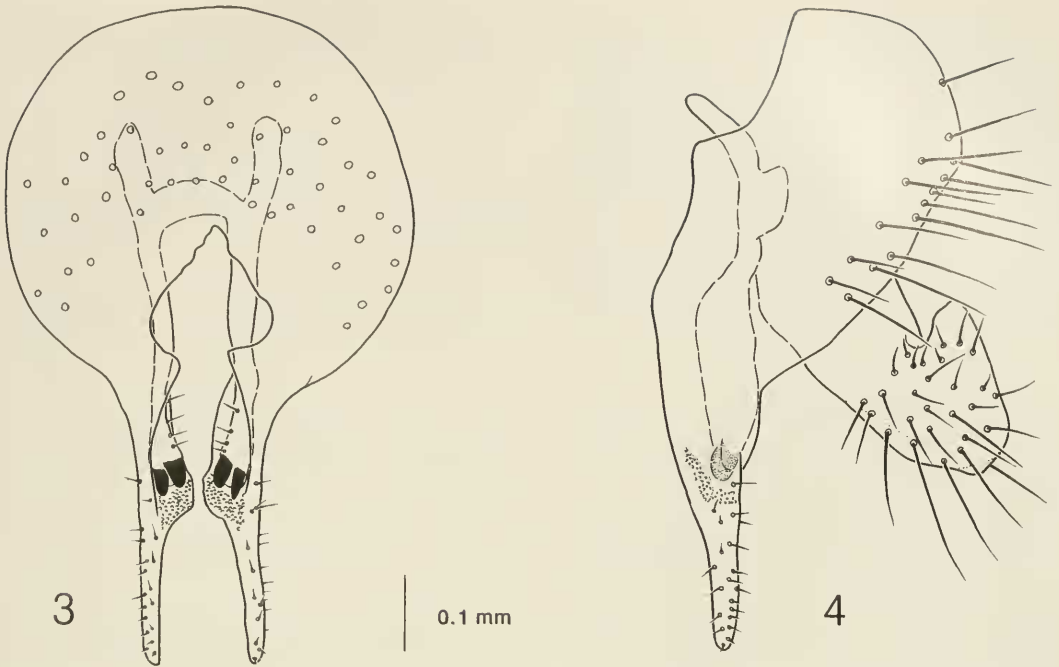
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Fig. 2. *Carpomya tica*, right wing.

a white medial scutal stripe or spot. *C. tica* also differs from other species of *Carpomyina*, including most of the other species of *Carpomya*, by the strongly swollen shape of its scutellum. Only *C. schineri* and *C. vesuviana* approach *C. tica* in scutellum shape, but neither has this structure as stout as in *C. tica*, and they further differ in the shape of the pale area of their scutellar color patterns, which is somewhat m-shaped, with a medial pale mark (see Freidberg and Kugler 1989, Fig. 188), rather than U-shaped as in *C. tica* (Fig. 1; the yellow areas are continuous on the extreme apex of the scutellum, visible in posterior view). In the key to Neotropical genera of Tephritidae in Foote (1980), *C. tica* will key to *Cecidochares*, which is not closely related (it belongs to the subfamily Tephritinae). Species of the latter genus differ as follows: body mostly dark brown, including all of the scutum and scutellum; at least some scutal setulae swollen; and outer and inner surstyli short.

Description.—Setae black. Body predominantly yellow. **Head:** Yellow. 3 frontal, 2 orbital setae, all large. Ocellar seta large (length about equal to width of frons). Facial carina weak. First flagellomere about 2 times as long as wide (lateral view), with small dorsoapical point. Proboscis short, capitate. **Thorax:** Mostly yellow. Postpro-

notal lobe, dorsal margin of anepisternum, and posterior third of notopleuron white. Mesonotum (Fig. 1) with following dark brown markings: medial spot from level of dorsocentral seta to level of acrostichal seta, extended laterally slightly beyond acrostichal seta; spot on anterior two-thirds of notopleuron, extended mesally on scutum to level of presutural supra-alar seta but not including it; broad spot along transverse suture; spot from wing base to slightly mesal to level of intra-alar seta and from postsutural supra-alar seta almost to post-alar and intra-alar setae; spot posterior and lateral to intra-alar seta; and scutellum, except for narrow, U-shaped yellow mark that includes apical and basal setae. Pleuron without dark brown markings. Subscutellum entirely dark brown. Mediotergite yellow laterally, broadly dark brown medially, more broadly so dorsally. Scutellum strongly swollen. Chaetotaxy as in *Rhagoletis* and *Carpomya*. Dorsocentral seta slightly anterior to level of postsutural supra-alar seta. Scapular setae white. Mesonotal setulae slender; those on scutum yellow or black, occurring in patches. Scutellum with yellow setulae, present only on yellow areas. Mesonotum mostly moderately densely pale microtrichose, except for dark brown part of notopleuron, dark brown spot along transverse suture, lateral half of brown spot



Figs. 3-4. *Carpomya tica*, male genitalia. 3, Epandrium and surstyli, posterior view (cerci not shown). 4, Epandrium, surstyli and cercus, lateral view.

between postsutural supra-alar and intra-alar setae, and spot posterior and lateral to intra-alar seta, which are densely black microtrichose, and the following nonmicrotrichose areas: dark brown part of scutum mesal to notopleural dark area; middle of medial scutal brown spot; mesal half of brown spot between postsutural supra-alar and intra-alar setae; and scutellum except yellow areas and base and apex of lateral brown area. Subscutellum and upper half of brown area of mediotergite densely blackish microtrichose; yellow parts of mediotergite moderately pale microtrichose; ventral part of brown area bare. *Legs*: Yellow, except hind tibia with basal posterior and subapical anterior and posterior brown spots. *Wing* (Fig. 2): With subbasal, discal, preapical and anterior apical bands. Accessory costal band and posterior apical bands absent. Discal and subapical bands parallel, perpendicular to long axis of wing; each broad, but not connected. Anterior apical band only narrowly connected to subapical

band in cell r_1 , and separated from costa by hyaline marginal spots in cells r_1 and cell r_{2+3} . Cell r_1 without spur vein from vein R_{2+3} in subapical band. Crossvein $r-m$ at 0.73 distance from $bm-cu$ to $dm-cu$ (just touching proximal margin of subapical band). Cell bcu with apical lobe 0.5 times as long as maximal width of cell. *Abdomen*: Mostly yellow, each tergite (through tergite 5) with unpaired medial and paired sublateral brown spots, small on syntergite 1+2. *Male terminalia* (Figs. 3-4): Epandrium brown, surstyli yellow. Outer surstylus slender, with distinct mesal lobe; part apical to mesal lobe with relatively few small setulae.

Spilographa caucasica Bigot

Hendel (1927) placed this species in *Carpomya*, but probably based on confusion with *Carpomya caucasica* Zaitzev (= *C. pardalina*). Without examination of the holotype it is difficult to recognize *S. caucasica*. Bigot's description is vague and there

are no illustrations. But it is very doubtful that *S. caucasica* belongs in *Carpomya*, as no species of that genus has a longitudinal band in addition to four transverse bands on the wing. Bigot's statement "quatre bandes roussâtres, peu distinctes, sises à la partie postérieure du thorax" (4 reddish bands, not very distinct, situated at the posterior part of the thorax), also seems questionable for a species of *Carpomya*, which except for *C. incompleta* (which has only 3 wing bands and therefore cannot be *S. caucasica*), have distinct dark brown spots or larger marks on the mesonotum. I cannot recognize *S. caucasica*, and treat it here as an unplaced species of Trypetinae.

Bigot (1880: 154, bottom of page) stated clearly that the species he described in this paper were in his collection, but Adrian Pont (personal communication) was unable to locate the single female (therefore holotype) of *S. caucasica* in the Bigot Collection at the University Museum, Oxford. He remarked that it is possibly there under "some other name that Bigot changed to *caucasica* with publication. He was prone to doing this, and it causes endless confusion."

RELATIONSHIPS AND CLASSIFICATION

The *Carpomyina* was proposed as a subtribe of Trypetini by Norrbom (1989), but is currently considered a subtribe of *Carpomyini* within the Trypetinae (Korneyev 1996). The desclerotized area at the apex of female sytergosternite 7 and the presence of stomal guards, usually distinctly sclerotized, in the larva are probable synapomorphies for the subtribe (Norrbom 1989, Carroll 1992). The shape of the male surstyli (inner and outer surstyli elongate, the latter with a long, apically directed posterior lobe and a short, mesally directed anterior lobe) is probably another synapomorphy of the *Carpomyina* or possibly for the *Carpomyini* (Korneyev 1996). Some reversal (reduction of the posterior lobe of the outer surstylus in a few taxa) must have occurred if this character was in the groundplan of the Car-

pomyina, but other character state distributions support that hypothesis (Norrbom 1989, 1994b).

Carpomya, as recognized here, includes six species: *C. incompleta* (Becker), *C. paraldalina* Bigot, *C. schineri* (Loew), *C. vesuviana* Costa, *C. wiedemanni* (Meigen), **NEW COMBINATION** and *C. tica*, n. sp. *Carpomya tica* belongs in the *Carpomyina*, or at least to the *Carpomyini*, based on the shape of its male genitalia; its surstyli have the typical *carpomyine* shape (Figs. 3–4). With most of the other species of *Carpomya*, *C. tica* shares a distinctive, apomorphic color pattern of the cuticle and microtrichia of the thorax, which is mostly yellow with dark brown to black marks on the scutum, scutellum, and subscutellum (Fig. 1; also see Freidberg and Kugler 1989, Figs. 188, 202, 209). The microtrichia are pale or gray, except on some of the dark brown areas, which are bare or have dense, blackish microtrichia. Except for the subscutellar marks, this pattern has been lost in *C. incompleta*, which shares several synapomorphies with *C. schineri* and *vesuviana* (see Fig. 5), indicating that it does belong in *Carpomya* (J. Jenkins, personal communication, has discovered a male genitalic synapomorphy that further supports this clade). This color pattern is unique within the *Carpomyina*; in other genera, the thorax is dark brown or black (except, in many species, for the whitish postpronotal lobe, dorsal anepisternal stripe, apical part of scutellum, and sometimes a medial scutal spot or stripe) or predominantly yellow to orange, or if partly or mostly dark brown (e.g., *Zonosemata* or *Rhagoletis suavis* species group), the pattern is much different than in *Carpomya*. Some species of Ceratitidina in the Dacini do have thoracic color patterns similar to *Carpomya*, thus convergent evolution of such a pattern in *C. tica* and the Old World species of *Carpomya* is possible, but I have discovered no apomorphies shared by *C. tica* and any other species of *Carpomyina* (or other Trypetinae) that would contradict the hypothesis that *Carpomya*, as de-

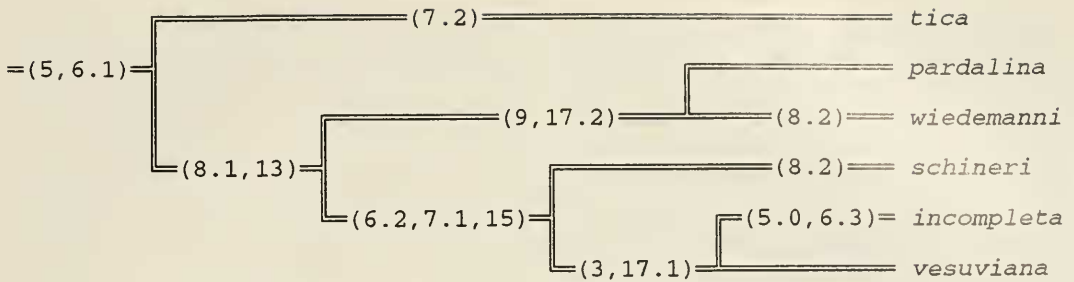


Fig. 5. Hypothesized phylogenetic relationships among species of *Carpomya*. Character numbers refer to Table 1.

limited here, is monophyletic. Other character state distributions indicate that the distal location of r-m in *C. tica* and *Cryptodacus* and *Haywardina cuculi* is the result of convergence (see Norrbom 1994b).

Certain characters of the wing pattern may be additional synapomorphies of *Carpomya*, although some species now placed in *Rhagoletis* (particularly the *tabellaria* species group) have similar wing patterns, so some or all of these characters could be plesiomorphic or synapomorphies at a higher level within the Carpomyina. Better understanding of the polarity and evolution of wing patterns within the Carpomyina is necessary to determine the phylogenetic significance of these characters, but at least the strong similarity of the wing pattern of *C. tica* with those of the other species of *Carpomya* does not contradict its classification in this genus. The similar elements of the wing pattern include: absence of the accessory costal band; absence of the posterior apical band; the broad width of all of the bands (reduced in *C. incompleta*) and their yellow to brown color; discal and subapical bands transverse and parallel; and the at least partial separation of the anterior apical band from the wing margin (Fig. 2; and Freidberg and Kugler 1989, Pl. VIII, Figs. 4, 8, 10).

The relationship of *Carpomya* to other genera of Carpomyina has not been resolved. Its closest relatives may be within the possibly paraphyletic genus *Rhagoletis*

(Bush 1966: 451), and I tentatively used the *R. tabellaria* group, which has similar wing patterns, as the outgroup for analysis of character polarity.

The Hennig86 analysis of relationships within *Carpomya* (based on the nine characters with an asterisk in Table 1) resulted in the single tree shown in Figure 5 (length 17 steps, consistency index 82, retention index 75). *Carpomya incompleta*, *schineri* and *vesuviana* form one monophyletic subgroup, and *C. pardalina* and *wiedemanni* form another. These groups together appear to be the sister group of *C. tica*. Despite having several distinctive autapomorphies (greatly elongated mouthparts and head, facial carina shape, apically rounded first flagellomere, and serrate aculeus tip; see Freidberg and Kugler 1989, Figs. 201, 204), *C. wiedemanni*, the type species of *Goniglossum*, appears to be most closely related to *C. pardalina*, which is the type species of *Myiopardalis*. The synonymy of *Goniglossum* and *Myiopardalis* with *Carpomya* (type species *C. vesuviana*) is a subjective decision of ranking, but their continued recognition as monotypic genera (or the placement of both species in *Goniglossum*) would require the proposal of yet another monotypic genus for *C. tica*. Considering the diversity of species now classified in *Rhagoletis*, I find the latter option undesirable. Already, Zaitzev (1919, 1947), Rohdendorf (1939) and Kandybina (1965, 1977) considered *Myiopardalis* a subgenus of *Carpomya*. The latter author found little

difference among the larvae of the species here included in *Carpomyia*, except that the oral ridges are reportedly nonserrate in *C. wiedemanni*. This character (not verified by personal examination by Kandybina in *C. wiedemanni*) varies in other genera (e.g., *Anastrepha*, see White and Elson-Harris 1992), and Kandybina otherwise considered *C. wiedemanni* larvae most similar to those of *C. pardalina* and *Rhagoletis flavigenualis* Hering of the *tabellaria* species group.

BIOGEOGRAPHY

The *Carpomyina* are distributed predominantly in the Holarctic Region and in higher altitude or temperate areas of the Neotropical Region. Although the Tephritidae and most of its major clades probably originated in the Old World, the discovery of *C. tica* in the Neotropics lends further support to the hypothesis that the *Carpomyina* originated and diversified in the Americas, with subsequent reinvasion of the Old World (Norrbon 1994a). Although a thorough phylogenetic analysis of the *Carpomyina* is needed to test this hypothesis of origin, it is supported by diversity data for the group. Except for the little known monotypic South African genus *Sclerophilus* Munro, which appears to belong in the *Carpomyina* (A. Freidberg, personal communication), all of the genera of *Carpomyina* are now known from the Americas. This includes all of the species groups of the large, probably paraphyletic genus *Rhagoletis*, except for the *cerasi* group. Furthermore, all of these taxa except *Carpomyia* and the *alternata* and *tabellaria* species groups of *Rhagoletis* are more diverse in the New World (Berlocher and Bush 1982, Norrbom 1994b).

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